Fangzheng Xie

Assistant Professor
Department of Statistics
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EDUCATION

Ph.D. in Applied Mathematics and Statistics
Johns Hopkins University, Baltimore, MD — August 2020
Advisor: Yanxun Xu, Ph.D.

M.A. in Applied Mathematics and Statistics
Johns Hopkins University, Baltimore, MD — Spring 2016

B.S. in Mathematics and Applied Mathematics
South China University of Technology, Guangzhou, China — July 2014

EMPLOYMENT

Assistant Professor
Department of Statistics — August 2020 - Present
Indiana University, Bloomington, IN

RESEARCH INTERESTS

- Low-rank random matrix models and statistical network analysis
- High-dimensional statistics
- Theory and methods for Bayesian nonparametrics
- Computer models and uncertainty quantification
- Bayesian methods development for electronic health/medical data and computational biology

PUBLICATIONS

1. **Xie, F.**, *Euclidean Representation of Low-Rank Matrices and Its Geometric Properties.* **SIAM Journal on Matrix Analysis and Applications**, 2023; 44 (2): 822–866 .
2. **Xie, F.**, *Entrywise limit theorems for eigenvectors of signal-plus-noise matrix models with weak signals.* **Bernoulli**, accepted for publication, 2023.
3. Gu, M., **Xie, F.**, and Wang, L., *A Theoretical Framework of the Scaled Gaussian Stochastic Process in Prediction and Calibration.* **SIAM/ASA Journal on Uncertainty Quantification**, 2022; 10 (4): 1965–1982.
4. **Xie, F.** and Xu, Y., *Efficient Estimation for Random Dot Product Graphs via a One-step Procedure.* **Journal of the American Statistical Association: Theory & Methods**, 2023; 118 (541): 651–664.
5. **Xie, F.**, Xu, Y., Priebe, C.E., and Cape, J., *Bayesian Sparse Spiked Covariance Model With a Continuous Matrix Shrinkage Prior.* **Bayesian Analysis**, 2022; 17 (4): 1193–1217.
6. **Xie, F.** and Xu, Y., *Bayesian Projected Calibration for Computer Models.* **Journal of the American Statistical Association: Theory & Methods**, 2022; 116 (536): 1965–1982.
7. **Xie, F.** and Xu, Y., *Optimal Bayesian Estimation for Random Dot Product Graphs.* **Biometrika**, 2020; 107 (4), 875–889.
8. **Xie, F.** and Xu, Y. *Adaptive Bayesian Nonparametric Regression using a Kernel Mixtures of Local Polynomials with Application to Partial Linear Models.* **Bayesian Analysis**, 2020; 15 (1): 159–186.

9. Li, Y., Xu, Y., **Xie, F.**, Bandyopadhyay, D.,*BAREB: A Bayesian repulsive biclustering model for periodontal data*. **Statistics in Medicine**, 2020; 39 (16): 2139–2151.
10. Wang, L., **Xie, F.**, and Xu, Y., *Simultaneous Learning the Dimension and Parameter of a Statistical Model with Big Data*, **Statistics in Biosciences**, accepted for publication, 2021.
11. **Xie, F.** and Xu, Y., *Bayesian Repulsive Gaussian Mixture Model*. **Journal of the American Statistical Association: Theory & Methods**, 2020; 115(529): 187–203. **(Winner of the O-Bayes 2017 Young Investigator Travel Award)**
12. **Xie, F.**, Jin, W., and Xu, Y., *Rates of Contraction with Respect to L_2-distance for Bayesian Nonparametric Regression*. **Electronic Journal of Statistics**, 2019, Vol. 13, No. 2, 3485–3512.
13. **Xie, F.**, Zhou, M., and Xu, Y., *BayCount: A Bayesian Decomposition Method for Inferring Tumor Heterogeneity using RNA-Seq Counts*. **Annals of Applied Statistics**, 2018, Vol. 12, No. 3, 1605–1627.

WORKING PAPERS

1. **Xie, F.**, Wu, D., *An Eigenvector-Assisted Estimation Framework for Signal-Plus-Noise Matrix Models*. Revision submitted to **Biometrika**, 2022+ (arXiv:2203.16688).
2. Wu, D., **Xie, F.**, *Statistical inference of random graphs with a surrogate likelihood function*. Technical report, 2022+ (arXiv:2207.01702).
3. Yao, D., **Xie, F.**, Xu, Y. *Bayesian Sparse Gaussian Mixture Model in High Dimensions*. Technical report, 2022+ (arXiv:2207.10301).
4. Zoh, R. S., **Xie, F.** *An approximate Bayes factor based high dimensional MANOVA using Random Projections*. Technical report, 2022+ (arXiv:2201.01641).
5. **Xie, F.**, Zhang, Y., *Higher-order entrywise eigenvector analysis of low-rank random matrices: Bias correction, Edgeworth expansion, and bootstrap*. Technical report, 2023+ (manuscript available upon request).

SUBMITTED GRANT

1. **Title:** New Theory and Method for Learning Low-Rank Matrix and Network Data

   Funding Agency: National Science Foundation (NSF) Division of Mathematical Science (DMS)

   Role: Principal Investigator

   Total Requested Amount: $188,520.00

   Submitted Date: 12/14/2022
2. **Title:** Novel Bayesian assessments of device-based physical activity and self-reported dietary intake in joint models of all-cause mortality and type 2 diabetes in a cohort of biracial older US adults

   Funding Agency: National Institutes of Health (NIH)

   Role: Co-Investigator (Principle Investigator: Roger S. Zoh)

   Submitted Date: 10/05/2022

SOFTWARES

1. R package `lgraph`: A package for learning low-rank network data using surrogate likelihood methods (available at `https://fangzheng-xie.github.io./`).
2. R package `BayProjected`: A package for calibrating computer models with observational data from physical system using the Bayesian projected calibration method (available at `https://fangzheng-xie.github.io./`).

3. R package `BayCount`: A package for inferring transcriptional tumor heterogeneity through RNA-Seq counts using a Bayesian matrix decomposition method built upon the negative binomial factor analysis model (available at `https://fangzheng-xie.github.io./`).

HONORS AND AWARDS

- Acheson J. Duncan Fund for the Advancement of Research in Statistics Travel Award 2017-2019
- O-Bayes 2017 Young Investigator Travel Award 2017
- Rufus P. Isaacs Graduate Fellowship, Johns Hopkins University 2017-2020

TEACHING EXPERIENCE

- STAT-S 520 Introduction to Statistics Fall 2023, Spring 2021, Fall 2020
- STAT-S 771/772 Advanced Data Analysis Fall 2023, Spring 2024
- STAT-S 785 Seminar on Statistical Theory Fall 2023, Spring 2024
- STAT-S 350 Introduction to Statistical Inference Spring 2023, Fall 2022
- STAT-S 722 Advanced Statistical Theory II Spring 2022
- STAT-S 721 Advanced Statistical Theory I Fall 2021

ACADEMIC PRESENTATIONS

An Eigenvector-Assisted Estimation Framework for Signal-Plus-Noise Matrix Models
Workshop on Statistical Network Analysis and Beyond, Anchorage, AK (Contributed) June 2023
ICSA Applied Statistics Symposium 2023, Ann Arbor, MI (Invited) June 2023
Department of Mathematics, Indiana University-Purdue University Indianapolis (Invited) February 2023

Central limit theorems for spectral estimators and their one-step refinement for sparse random graphs
Department of Statistics, University of Pittsburgh (Invited) October 2021
Department of Bioinformatics and Biostatistics, University of Louisville (Invited) September 2021

Euclidean Representation of Low-Rank Matrices and Its Statistical Applications
Joint Statistical Meetings 2020 August 2021
International Chinese Statistical Association Applied Statistics Symposium 2021 September 2021

One-step Refinement of Spectral Methods for Low-rank Random Graphs
Luddy School of Informatics, Computing, and Engineering, Indiana University (Invited) February 2021

Global and Local Estimation of Low-rank Random Graphs using Likelihood-based Methods
Department of Statistics, Rutgers, the State University of New Jersey (Invited) February 2020
Department of Data Sciences and Operations, University of Southern California (Invited) February 2020
Department of Statistics, University of California, Santa Cruz (Invited) February 2020
Department of Statistics, Indiana University (Invited) January 2020
Department of Statistics, University of Virginia (Invited) January 2020
Department of Statistics, University of British Columbia (Invited) January 2020
School of Statistics, University of Minnesota (Invited) January 2020
Department of Statistics and Actuarial Science, University of Waterloo (Invited) January 2020
Department of Statistics, Florida State University (Invited) January 2020
Department of Statistics, University of Illinois (Invited) November 2019

Bayesian Projected Calibration of Computer Models
Joint Statistical Meetings (JSM) 2022, Washington D.C. August 2022

Joint Statistical Meetings (JSM) 2019 (Poster Session), Denver, CO July 2019

A Theoretical Framework for Bayesian Nonparametric Regression
Joint Statistical Meetings (JSM) 2018 (Speed Session), Vancouver, BC, Canada July 2018

Bayesian Repulsive Gaussian Mixture Model
International Workshop on Objective Bayes Methodology (Poster Session), Austin, TX December 2016

STUDENT ADVISING

Dingbo Wu (PhD advisee and Data Analysis Project Advisee)
John Koo (PhD thesis committee)

PROFESSIONAL SERVICE

Journal Referee: Annals of Statistics, Journal of the American Statistical Association, Journal of Econometrics, Journal of Computational and Graphical Statistics, Bayesian Analysis, IEEE Transactions on Pattern Analysis and Machine Intelligence, Test, Journal of Statistical Planning and Inference, Journal of Statistical Computation and Simulation.

Department of Statistics Colloquium/Seminar Series Organizer 2022-2023